

# Varun Madabushi

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## EDUCATION

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### Georgia Institute of Technology

Atlanta, GA

*B.S. in Electrical Engineering, Minor in Robotics; GPA: 3.93/4.00*

*Aug 2017 – Dec 2020*

*M.S. in Electrical and Computer Engineering; GPA: 4.00/4.00*

*Jan 2021 – May 2022*

*PhD. in Robotics; GPA: 4.00/4.00*

*Aug 2024 – May 2028 (Expected)*

## EXPERIENCE

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### Dynamic Mobility Lab

Atlanta, GA

*Graduate Researcher*

*Aug 2024 – Present*

- Developed bipedal robot control system utilizing offline trajectory optimization and reinforcement learning to generate stepping behaviors that are natural-looking, easily tunable, and train faster than comparable approaches
- Researching integration of reachability analysis tools into trajectory optimization pipeline to produce inherently robust and safe controllers for bipedal robots

### Johns Hopkins University Applied Physics Laboratory

Laurel, MD

*Robotics Engineer*

*Jun 2022 – Jul 2024*

- Led statistical verification and operational analysis, and assisted in development of Nonlinear Model Predictive Control (NMPC) algorithm for multi-agent fixed-wing Unmanned Aerial Vehicle systems
- Provided hardware and software support for numerous outdoor flight tests of NMPC-based UAV landing controller
- Implemented trajectory optimization to realize manipulation behaviors such grasping and valve turning on unmanned underwater mobile manipulator (awarded top prize in internal R&D across all of the company)
- Co-led short-term research on robot co-design, which leveraged bayesian optimization to automatically choose task-optimal hardware and control parameters for hexapod robot system
- Mentored high school interns on mechanical and software design of robotic manipulator

### Intelligent Vision and Automation Lab

Atlanta, GA

*Graduate Researcher*

*Jan 2022 – Aug 2022*

- Combined model predictive and reinforcement learning-based elements in heirarchial aircraft controller to improve generalization to various aircraft types
- Developed trajectory library in MATLAB utilizing convex optimization to generate composite bezier spline paths

### Lawrence Livermore National Laboratory

Livermore, CA

*Defense Technologies Engineering Intern*

*May 2020 – Aug 2020, Sep 2021 – Apr 2022*

- Designed simulator and hardware-in-the-loop testing for Unmanned Surface Vehicle (USV) control system
- Developed actuator and hydrodynamic drag models fit from experimental data, used to inform new USV design
- Led development of data collection system integrating cameras, hydrophones, and FPGA on custom PCB

## SKILLS

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**Concepts:** Nonlinear Systems, Optimal Control, System Identification, Reinforcement Learning, Sim-to-Real Transfer

**Programming:** C++, Python, MATLAB, CUDA, ROS, Docker, STM32, Arduino

**Software:** MuJoCo, Solidworks, OnShape, Altium, KiCAD

**Tools:** Soldering (SMD and THT), Mill, Lathe, 3D Printer, Oscilloscope, Logic Analyzer

## PUBLICATIONS

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- [1] V. Madabushi, Y. Kopel, A. Polevoy, and J. Moore, “Dense fixed-wing swarming using receding-horizon nmmpc,” in *2025 IEEE (ICRA)*, 2025.
- [2] R. Kim, V. Madabushi, E. Dong, and A. Mazumdar, “Increasing mobile robot efficiency and versatility through manipulation-driven adaptation1,” *Journal of Mechanisms and Robotics*, vol. 13, no. 5,